

WHAT IS CLAIMED IS:

1 1. An apparatus for driving a liquid crystal display including a plurality of pixels
2 arranged in a matrix, the apparatus comprising:

3 a data driver selecting data voltages from a plurality of gray voltages corresponding to
4 image data representing at least a gray and applying the data voltages to the pixels; and

5 a signal controller supplying the image data to the data driver and generating digital gray
6 data based on a distribution of the gray of the image data for a frame.

1 2. The apparatus of claim 1, wherein the apparatus further comprises a digital/analog
2 converter converting the digital gray data from the signal controller into analog voltages and
3 supplying the analog voltages to the data driver as the gray voltages.

1 3. The apparatus of claim 1, wherein each image data has a luminance data having a
2 value, which is determined by the at least a gray represented by the image data and belong to one
3 of a plurality of value sections, and the gray distribution is associated with the number of the
4 image data belong to respective value sections.

1 4. The apparatus of claim 3, wherein each image data includes a set of image data
2 portions for a predetermined number of respective colors, and the luminance data of the image
3 data is defined as an average of the grays represented by the set of the image data portions
4 forming the image data.

1 5. The apparatus of claim 3, wherein the signal controller comprises a gray voltage

2 generator reading out the image data for one frame, calculating the gray distribution of the image
3 data," and modifying a standard gray voltage curve to obtain the digital gray data.

1 6. The apparatus of claim 5, wherein the gray voltage generator calculates the
2 luminance data of the image data for one frame, calculates the number of the image data
3 included in the value sections to obtain the gray distribution of the image data.

1 7. The apparatus of claim 6, wherein the gray voltage generator calculates a target
2 gray voltage (VG_x') of each value section corresponding to the digital data voltage based on
3 relations given by:

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$$\Delta V_x' = \Delta V_x \cdot (1 + K_x \cdot \Delta P_x) \text{ and } VG_x' = \Delta V_x' \cdot (\Sigma \Delta V / \Sigma \Delta V') + VG_{x-1},$$

5 where ΔV_x is a difference between a maximum gray voltage and a minimum gray voltage for the
6 value section on the standard gray voltage curve, K_x is a weight value assigned to the section,
7 ΔP_x is defined as $P_x - (AP)_x$, where P_x is a distribution probability for the value section and $(AP)_x$
8 is a distribution probability for maintaining the standard gray voltage curve, $\Sigma \Delta V$ is a sum of the
9 differences (ΔV_x) between maximum gray voltages and minimum gray voltages for the
10 respective value sections on the standard gray voltage curve, $\Sigma \Delta V'$ is a sum of $\Delta V_x'$, and VG_{x-1}
11 is a maximum gray voltage of a previous value section in the standard gray voltage curve.

1 8. The apparatus of claim 7, wherein the weight value (K_x) for each section is
2 determined as the value exhibiting the best visibility for the value section.

1 9. A method for driving a liquid crystal display, the method comprising:
2 reading out image data representing at least a gray for one frame;

3 calculating gray distribution of the read image data; and
4 modifying a standard gray voltage curve based on the calculated gray distribution to
5 generate digital gray data.

1 10. The method of claim 9, wherein the gray distribution calculation comprises:
2 calculating luminance data of the image data based on the at least a gray represented by
3 the image data; and
4 counting the number of the image data included in a plurality of sections of the luminance
5 data.

1 11. The method of claim 10, wherein the digital data voltage (VG_x') is calculated
2 based on relations given by:

$$\Delta V_x' = \Delta V_x(1 + K_x \cdot \Delta P_x) \text{ and } VG_x' = \Delta V_x' \cdot (\Sigma \Delta V / \Sigma \Delta V') + VG_{x-1},$$

3 where ΔV_x is a difference between a maximum gray voltage and a minimum gray voltage for the
4 value section on the standard gray voltage curve, K_x is a weight value assigned to the section,
5 ΔP_x is defined as $P_x - (AP)_x$, where P_x is a distribution probability for the value section and $(AP)_x$
6 is a distribution probability for maintaining the standard gray voltage curve, $\Sigma \Delta V$ is a sum of the
7 differences (ΔV_x) between maximum gray voltages and minimum gray voltages for the
8 respective value sections on the standard gray voltage curve, $\Sigma \Delta V'$ is a sum of $\Delta V_x'$, and VG_{x-1}
9 is a maximum gray voltage of a previous value section in the standard gray voltage curve.
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1 12. The apparatus of claim 11, wherein the weight value (K_x) for each section is
2 determined as the value exhibiting the best visibility for the value section.

1 13. The method of claim 10, wherein each image data includes a set of image data
2 portions for a predetermined number of respective colors, and the luminance data of the image
3 data is defined as an average of the grays represented by the set of the image data portions
4 forming the image data.